

to 8° below zero, a thermometer on the surface of the snow, in the shade, indicated 7.5° below zero; at the same time one 6 inches below the surface read 14° above zero; and one 10 inches below the surface and touching the ground read 31°, the same as the evening before.

On the morning of the 11th, when the average temperature of the air had been 2° below zero for the preceding twenty-four hours, a temperature of 27° was registered by a thermometer 10 inches below the surface of the snow and in contact with the ground. This was the lowest temperature observed in the layer of snow immediately touching the soil.

Observations were made also in a spot of several square yards in extent from which the snow had been blown till it measured but 6 inches in depth. The temperature of the snow in contact with the ground was found to range from 31.5° to 27°. The snow in this place was exposed to the sun throughout the day.

On the 14th, observations were made in snow 25 inches deep, the depth of the snow having been greatly increased by the storm of the 11-13th. The results were the same as had been previously found so far as regards the temperature of the snow immediately on the surface of the ground.

It was noticed in all our observations that the temperature of the snow layer immediately touching the ground was fairly uniform, being on the average 31°. During the period covered by our observations the extreme range of temperature of the snow layer in contact with the ground was but 5°, while that of the atmosphere was 37°. The greatest difference observed between the atmospheric temperature and that of the snow near the ground was 38.5°, on the morning of the 10th, the temperature of the air being 7.5° below zero, and that of the snow layer touching the ground 31° above zero.

The observations made in snow upon which the sun had shone for some hours showed that the temperature of the superficial layer of the snow was considerably influenced by direct solar radiation.

The most striking fact developed in our observations was the relatively high and uniform temperature observed at the surface of the ground. This was due undoubtedly to the barrier to radiation interposed by the snow mantle. From the 5th to 14th, inclusive, the average temperature of the air was 13°, and the average temperature of the snow covered soil was certainly not below 31°. In other words, notwithstanding the fact that the temperature of the air was for 240 hours 18° lower than that of the soil, yet the latter apparently lost none of its heat. That the surface soil actually lost heat there can be no doubt, but the loss was gradual and no more rapid than the rate of conduction upward from the warmer underlying layers of earth.

The practical benefits resulting from these two snow storms, storms in which few perhaps saw any good, may now be mentioned. Had the severe cold that came with and stayed after the snows occurred without snow, or without a snow covered ground, the temperature of the soil would have fallen many degrees below freezing, and the damage to vegetation resulting from the freezing of the roots would have been enormous. But wherever the ground was covered by snow no such damage was done.

The observations are shown in detail in the table.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made nearly in accordance with the new form, No. 1040, and the arrange-

ment of the columns, therefore, differs from those previously published.

Meteorological observations at Honolulu.

FEBRUARY, 1899.

The station is at 21° 18' N., 157° 50' W.; altitude 50 feet. Pressure is corrected for temperature and reduced to sea level, and the gravity correction, -0.06, has been applied.

The average direction and maximum force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is now given as measured at 1 p. m. Greenwich time on the respective dates.

The rain gauge, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2:30 a. m., Honolulu time, of the respective dates.									
		Dry bulb.	Wet bulb.	Temperature.		Means.		Wind.		Total rainfall.	Average cloudiness.	Sea-level pressures.	
				Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Maximum force.			Maximum.	Minimum.
1.....	29.83	64	68.5	78	62	63.3	++	nne.	3	0.00	5-2	29.99	29.88
2.....	29.78	63	63	78	62	64.5	++	nne-w.	1	0.00	6	29.85	29.74
3.....	29.82	64	62	77	62	64.5	81	sw.	1	0.02	3-6	29.85	29.76
4.....	29.82	66	64	78	62	63.5	84	sw-w.	1	0.00	1-3	29.88	29.78
5.....	29.85	69	66.5	79	63	65.5	73	sw-w.	2	0.00	2-7	29.88	29.83
6.....	29.92	70	69	79	68	66.3	78	sw.	3-1	0.01	5-2	29.93	29.86
7.....	29.91	69	67	80	69	69.0	86	sw.	3-1	2.33	8-10	29.97	29.90
8.....	29.94	68	67	73	68	67.5	92	sw-w.	2-0	1.07	10	29.98	29.91
9.....	29.99	67	66.5	78	67	68.5	87	sw.	2-0	0.00	3-8	29.99	29.92
10.....	30.06	64	63	78	67	67.7	90	sw-s.	1-0	0.02	2	30.06	30.00
11.....	30.04	63	62.5	80	63	64.0	69	s-e.	1	0.00	1	30.10	30.00
12.....	30.00	64	63	81	62	64.7	80	se-ne.	2-0	0.00	1-3	30.08	29.99
13.....	30.01	69	64	79	63	64.0	81	sw-nw.	2	0.01	3-7	30.04	29.97
14.....	30.00	68	64	78	63	63.7	71	ne-s.	2-0	0.00	5	30.07	29.98
15.....	30.03	67	65	80	67	64.0	74	sw.	1	0.00	5	30.07	30.01
16.....	30.01	69	67.5	80	64	66.0	81	s.	1	0.06	5	30.09	30.00
17.....	30.01	65	64	80	65	67.5	84	ne-sw.	1-0	0.00	6-1	30.06	29.97
18.....	30.00	72	64	79	64	68.5	78	s-ne.	1	0.00	5	30.04	29.96
19.....	29.97	73	67	78	71	69.7	64	ne.	3	0.05	6	30.03	29.96
20.....	29.99	73	65	79	70	68.0	68	ne.	3-0	0.00	4	30.04	29.96
21.....	29.99	72	65.5	80	66	63.0	66	ne.	2	0.01	3-6	30.08	29.96
22.....	29.97	71	64.5	78	71	61.7	67	ne.	3-4	0.03	4	30.03	29.95
23.....	29.94	71	65	77	69	63.0	68	ne.	3-4	0.08	2-6	30.00	29.90
24.....	29.95	71	66	78	69	63.3	73	ne.	4	0.04	5-8	29.99	29.91
25.....	30.01	72	67	80	68	64.0	70	ne.	3-0	0.09	7	30.01	29.96
26.....	30.07	72	66	79	68	64.5	70	ne.	3-5	0.01	5	30.09	30.01
27.....	30.05	69	66	78	71	61.5	64	ne.	4-6	0.15	8	30.10	30.01
28.....	30.05	71	65	77	68	63.8	76	ne.	5-6	0.03	9-6	30.10	30.01
Sums..	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.01	.....	.....	.....
Means.	29.961	68.4	65.0	77.0	66.1	64.4	76.3	.....	1	.....	7	30.012	29.981
Departure..	-0.01	.....	.....	.....	.....	+2.2	+0.3	.....	.....	-1.00	.....	.....	.....

Mean temperature for February, 1899 (6+2+9)÷3=71.9°; normal is 70.3°. Mean pressure for February is 29.96; normal is 29.97.

* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 8 a. m., local, or 4:30 p. m., Greenwich time. ‡ These values are the means of (6+9+2+9)÷4. § Beaufort scale. ¶ Mean for the daytime is 1.0. ¶ The mean during daylight is 4.4.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

- Annales Agronomiques, Paris, Tome 25.*
Pagnoul. Influence des pluies et de la nature des terres sur le rendement des fourrages. P. 83.
Scottish Geographical Magazine, Edinburgh, Vol. 15.
Taylor, W. A. Meteorology of Mount Etna. [Abstract from Ciel et Terre.] P. 147.
Nature, London, Vol. 59.
Arcimis, A. Probable Weather Conditions in Spain, during the Total Solar Eclipse of May 28, 1900. P. 439.
MacDowall, A. B. American and English Winters. P. 416.